

1 **SPECIFICATION:**

2 **FIELD OF THE INVENTION:**

3 Many imaging devices such as copiers, laser printers, and facsimile machines
4 use toner cartridges. The toner cartridge contains many of the moving parts of the
5 machine and contains a finite supply of toner. The original equipment manufacturers
6 (OEM) intended for the consumer to use the toner cartridge until the initial toner
7 supply is exhausted, and then replace it with a new laser toner cartridge. By placing
8 many of the moving parts in the toner cartridge and making the toner cartridge
9 disposable, the OEM reduced the amount of repair work required on the printers,
10 copiers, or facsimile machines.

11 The used toner cartridge has many components that may be recycled. An
12 industry known as the remanufacturing industry has arisen to take advantage of this
13 fact. Remanufacturers take used toner cartridges, clean them, repair damaged
14 components, replace worn out components, add new toner, and reintroduce these
15 refurbished cartridges into the marketplace.

16 In the original manufacturing process, the OEM takes a toner hopper
17 reservoir, seals it, and then ultrasonically welds it to a developer roller housing,
18 creating a combined unit, the toner hopper assembly. The toner hopper assembly is
19 further combined with a waste bin assembly as well as two endplates, which are
20 attached to both ends of the cartridge, to create a fully assembled toner cartridge.

21 In the remanufacturing assembly process, the remanufacturers must first
22 disassemble the cartridge before they can refurbish the cartridge. The disassembly
23 process is in reverse order of the assembly procedure. Access to the various

1 subcomponents can only be accomplished by tearing the cartridge down to its basic
2 parts. By separating the toner hopper reservoir from the developer roller housing,
3 remanufacturers duplicate the condition the cartridge was in when it was new. In the
4 remanufacturing process, after remanufacturers place a seal over the toner hopper
5 discharge opening, they reattach the toner hopper reservoir to the developer roller
6 housing, and continue on with the complete reassembly of the toner cartridge.

7 When a remanufacturer reassembles the toner cartridge, the original fastening
8 methods may not be efficiently reapplied. For example, where there may have been
9 an ultrasonic weld during the original OEM assembly, the weld location may not have
10 enough material left to be welded. In addition, in order to reinitiate an ultrasonic
11 weld at a specific location, the cartridge might have to be disassembled further thus
12 making the reassembly process more difficult and less efficient. Welding, gluing or
13 other permanent joining also makes disassembly for remanufacturing on the next
14 cycle more difficult.

15 The present invention illustrates a method of removably securing the various
16 pieces of a toner cartridge without sacrificing stability, repeatability, and efficiency.
17 By securing the endplate to the toner hopper reservoir using the present invention, the
18 endplate may more easily be removed and reattached. This allows future recycling to
19 be performed with much less effort as the various sections may be separated
20 relatively easily. The securing anchor will provide a “quick connect” or a “quick
21 disconnect.”

22 Another advantage of the preferred embodiment is that it allows various
23 attaching methods to be applied to the securing anchor. With this in mind, the

1 preferred embodiment of the present invention will need to be mounted securely
2 enough to be able to support screws that will be inserted through the endplate and
3 attached to the apparatus. These screws will hold the endplate in place on the toner
4 hopper reservoir. The present invention will be substantially rigid, insuring that the
5 waste bin assembly and toner hopper reservoir will maintain proper alignment and
6 stiffness via the endplate. The preferred embodiment of the present invention in
7 conjunction with the endplate will provide added rigidity to the toner hopper reservoir
8 and waste bin assembly once they are mated together. An example of a toner
9 cartridge that can employ the present invention is the HP4200 toner cartridge
10 manufactured by Hewlett-Packard.

11

1 **SUMMARY OF INVENTION:**

2
3 A method for reassembling a used toner cartridge comprising the steps of
4 providing a toner cartridge assembly, the toner cartridge assembly having a
5 contact side, a contact side endplate, a toner hopper assembly, a waste bin
6 assembly, the contact side endplate securing the toner hopper and the waste bin
7 assembly. Then removing said contact side faceplate from the contact side of the
8 toner cartridge assembly by removing fastening screws and severing a plastic
9 weld. Next, drilling a hole in the contact side endplate at the plastic weld as well
10 as boring an orifice in the toner hopper assembly where the plastic weld is
11 located. At this stage, one could use glue to permanently reattach the pieces
12 together. However if glue were used, the endplate would be permanently attached
13 and further refurbishing cycles would not be possible. Instead, a new securing
14 device or anchor could be introduced into the cleaned orifices in order to be able
15 to use screws to secure the faceplate. If a screw were to be used, the faceplate
16 could be recycled at a later point in time. The anchor must be able to withstand
17 the pulling pressure applied by the screw. The securing screw will extend through
18 the hole and attach to the anchor and hold the endplate securely in place.

1 **BRIEF DESCRIPTION OF THE DRAWINGS**

2 This invention is explained below in detail referring to the accompanying drawing.

3 FIG. 1A is a front perspective view of the securing fixture.

4 FIG. 1B is a top view of the securing fixture.

5 FIG. 1C is a bottom view of the securing fixture.

6 FIG. 2A is a front perspective view of the HP4200 Toner Cartridge (Prior Art).

7 FIG. 2B is a cross sectional view of the HP4200 Toner Cartridge (Prior Art).

8 FIG. 3A is a front perspective view of the HP4200 Toner Cartridge with securing
9 fixture attached.

10 FIG. 3B is a cross sectional view of the HP4200 Toner Cartridge with securing
11 fixture attached.

12 FIG. 4 is a front perspective view of the toner hopper reservoir (Prior Art).

13 FIG. 5 is a front perspective view of the developer roller housing (Prior Art).

14 FIG. 6A is a top perspective view of a cleaning template.

15 FIG. 6B is a bottom perspective view of a cleaning template.

16 FIG. 7 is a side perspective view of a cleaning template being mounted on a toner
17 hopper reservoir.

18 FIG. 8A is a perspective view of a cylindrical anchoring fixture.

19 FIG. 8B is a perspective view of a cylindrical anchoring fixture with contact ribs.

20 FIG. 8C is a perspective view of a non-cylindrical anchoring fixture with one contact
21 rib.

22 FIG. 8D is a perspective view of a non-cylindrical anchoring fixture with multiple
23 contact ribs.

- 1 FIG. 8E is a perspective view of a non-cylindrical anchoring external wall attaching
- 2 anchoring fixture.
- 3 FIG. 8F is a perspective view of a non-cylindrical anchoring fixture with screw
- 4 activated multiple contact ribs.
- 5

1 DETAILED DESCRIPTION

2 An example of a securing fixture is illustrated in Figures 1A, 1B and 1C.
3 Figure 1A is a front perspective view of the securing fixture 1. The securing fixture 1
4 comprises a lip 2 and ribs 3. The securing fixture 1 can be made of plastic. The
5 securing fixture 1 may also be made of aluminum, steel or other types of metals, or
6 other stiff materials. The main requirement would be that the securing fixture 1 be
7 strong enough to absorb an upward force being applied by horizontal foam units 18
8 (Figure 4.) through a forward securing edge 7 of a developer roller housing 6 (Figure
9 2B) against the lip 2. The securing fixture must be rigid enough not to flex once this
10 pressure is applied. If using another type of securing device such as a spring or other
11 flexible material, this device may initially flex when the two pieces are mated
12 together and could possibly flex during the life of the cartridge.

13 The securing fixture 1 may contain ribs 3, which will help provide support for
14 the lip 2. The ribs 3 are pointed out in Figure 1A and Figure 1B. These ribs 3 will
15 keep the lip 2 from bending backwards by distributing the load being applied by the
16 horizontal foam units 18. Preferably, the ribs 3 will extend the entire length of the
17 securing fixture 1, but they may be as simple as a single rib or as complex as a lattice
18 of ribs.

19 The bottom of the securing fixture 1 as shown in Figure 1C may be smooth or
20 possibly textured, as long as it provides a sufficient surface area to be attached to the
21 toner reservoir. The main requirement is that it be large enough to provide enough
22 adhesion area. In the preferred embodiment, double-sided tape may be used. If

1 gluing, both the bottom of the fixture and the area where it will be mounted may be
2 grooved in order to allow the glue additional surfaces to bond to.

3 The securing fixture will fit within the boundary defined as an upper
4 horizontal mounting area **10** on the toner hopper reservoir as shown in the prior art in
5 Figures 2A&B. On the HP4200 toner hopper reservoir **5**, this area is easily identified
6 because it has raised edges, which define the outline of the upper horizontal mounting
7 area **10**. As well, the securing fixture **1** may be a single device that extends the entire
8 length equal to that of the forward securing edge **7**. An alternative would be to have
9 two or more securing fixtures of varying lengths and sizes as long as the securing
10 fixture(s) fit within the particular securing area.

11 The length and size of the lip **2** will be determined by the relative force being
12 applied by the forward securing edge **7** as well as the amount of free space available
13 between the developer roller housing and the toner reservoir. The longer the lip **2**
14 extends from the base of the securing fixture **1**, the more torque will be applied to the
15 fulcrum or back of the securing fixture **1**, and in turn may affect the adhesive or other
16 method of attaching the securing fixture **1** to the toner hopper reservoir **5**. As well,
17 the lip **2** may not extend too far as it will interfere with the developer roller housing
18 as it mates up with the toner hopper reservoir. In the preferred embodiment of a
19 securing fixture, the lip will extend the full length of the securing fixture **1**.

20 The method of attaching the securing fixture **1** to the toner hopper reservoir **5**
21 may also vary. As previously discussed, the securing fixture may be secured by using
22 a very strong double-sided tape. The tape would need to be strong enough to
23 withstand the upward force being encountered by the lip **2** but not permanent in case

1 the securing fixture 1 itself may need to be replaced. Other alternatives would be to
2 attach the securing fixture with glue or possibly melting it into place. The
3 disadvantage of gluing or melting the securing fixture 1 into place would be that
4 replacing the securing fixture 1 at a later point in time would have to break this
5 adhesive bond and if glued, the separation process could possibly damage the
6 cartridge. Instead of using the securing fixture, ultrasonic welding may also be
7 employed to secure the toner hopper reservoir 5 to the developer roller housing 6, but
8 this process may not be cost effective for a remanufacturer.

9 An alternative may be to use a leaf spring to hold the developer roller housing
10 6 in place. The leaf spring would not be rigid per se, but could flex enough to add the
11 extra force necessary to keep the joint secure. The leaf spring could be mounted on
12 the upper horizontal mounting surface 10, so that it would make contact with the
13 forward securing edge 7 of the developer roller housing 6. It is possible that the leaf
14 spring, once mounted on the upper horizontal mounting surface 10, may actually
15 touch the weld joint 11 prior to the mating of the developer roller housing 6 to the
16 toner hopper assembly 4. Thus the forward securing edge 7 of the developer roller
17 housing 6 would displace the spring as it was inserted.

18 Figure 2A also shows some of the individual parts of an HP4200 toner hopper
19 assembly 4. The toner hopper assembly 4 consists of a developer roller housing 6 and
20 a toner hopper reservoir 5. Figure 2A also shows an upper horizontal mounting
21 surface 10, where the securing fixture 1 might be placed. The disassembling of the
22 toner hopper assembly 4 will be covered in greater detail in subsequent sections of
23 this specification.

1 Figure 2B is a cross sectional drawing of the same toner hopper assembly 4.
2 From this drawing it is clear to see how the present invention is necessary to easily
3 reassemble the toner hopper assembly 4 without having to glue or weld the developer
4 roller housing 6 to the toner hopper reservoir 5. In this figure, it is easier to identify
5 the forward securing edge 7 of the developer roller housing 6, which is ultrasonically
6 welded to the toner hopper reservoir 5 in the original OEM assembly. This weld joint
7 11 is what keeps this side of the toner hopper assembly from separating. There is a
8 corresponding weld joint 11 on the other side of the cartridge. The weld joint 11 on
9 the rear portion of the toner housing assembly 4 is in between the upper rear securing
10 flange 8 of the developer roller housing 6 and a lower rear securing flange 9 which is
11 part of the toner hopper reservoir 5. The combination of the upper rear securing
12 flange 8 and the lower rear-securing flange 9 create a combined rear-securing flange
13 12. When separating the developer roller housing 6 from the toner hopper reservoir
14 5, these weld joints 11 must be severed.

15 The toner hopper reservoir 5 additionally comprises various other mounting
16 surfaces for the securing fixture 1. In the preferred embodiment, it is on an upper
17 horizontal mounting surface 10 that the securing fixture 1 will be attached. A
18 different securing fixture 1 might be designed to attach to a vertical mounting surface
19 13 or a second horizontal mounting surface 14. The shape of the securing fixture 1
20 will have to be adjusted accordingly to be able to fit along the contour of the toner
21 hopper reservoir 5 and still provide some type of means to secure the developer roller
22 housing. A securing fixture might also be designed to use the bottom of the toner
23 hopper reservoir 5, which has a raised edge, as a securing location.

1 Figure 3A shows the same HP4200 toner hopper assembly **4** as illustrated in
2 Figure 2A except that it has a securing fixture **1** attached. Figure 3B shows cross
3 sectional view of an HP4200 toner hopper assembly with the securing fixture **1**
4 attached. The lip **2** can be seen to protrude roughly parallel to the bottom of the
5 securing fixture **1**. In this figure, the width of the securing fixture **1** can be seen
6 conforming to the dimensions of the upper horizontal mounting surface **10**. It is
7 between the bottom of the securing fixture and the upper horizontal mounting surface
8 **10** that some type of affixing agent would be applied. Also from this figure it can be
9 seen that the forward securing edge **7** of the developer roller housing **6** tucks under
10 the lip of the securing fixture **1**. Another type of securing fixture could be made such
11 that it could be attached to both the vertical mounting surface **13** as well as the upper
12 horizontal mounting surface **10**.

13 When separating the toner hopper assembly **4** into its various subcomponents,
14 different methods and tools may be employed. Figure 4 illustrates the major
15 components of the toner hopper reservoir **5**. On each end of the toner hopper
16 assembly are two endplates, a drive side endplate **15** and a contact side endplate **16**.
17 There are several screws holding both endplates in place. Once these screws are
18 removed, the drive side endplate **15** will easily become detached. However on the
19 contact side endplate **16**, there are three additional polystyrene welds holding the
20 contact side endplate **16** to the toner hopper assembly **4**. Once weakened, these welds
21 can be broken using a flat head screwdriver.

22 After removal of the endplates **15** & **16**, the toner hopper reservoir **5** and the
23 developer roller housing **6** will need to be separated. As discussed previously, this

1 can be accomplished in several ways such as a wedge, a blade or mechanical saw. In
2 cartridges that have both a front and rear combined flange, a unique tool may be
3 employed to remove this ultrasonic weld. This tool is unique in that it may be
4 adjusted to fit various types of cartridges, which may have different sizes and shapes.
5 The blades are very thin so that the weld is the only part being removed. If the blades
6 were too thick, too much material of the toner hopper reservoir **5** or developer roller
7 housing **6** would also be removed.

8 The main components of the developer roller housing **6** are shown in Figure 5.
9 From this illustration, the forward securing edge **7** is clearly visible. As well, at the
10 rear of the developer roller housing **6**, is the upper rear-securing flange.

11 An example of the items in the toner cartridge that might need to be replaced
12 may include the OPC drum, PCR, gears, encoder wheels, and wiper blades just to
13 name a few. As well, toner from the waste bin assembly and any remaining toner left
14 over in the toner hopper reservoir **5** will need to be removed. New toner may be
15 added once the cartridge is sufficiently cleaned. There will be various cleaning,
16 prepping and refurbishing procedures that will all be performed in sequence as the
17 cartridge is reconditioned.

18 The various pieces that will be reassembled on the toner hopper reservoir **5**
19 are illustrated in Figure 4. A sealing unit **17** will be placed on the toner hopper
20 reservoir **5** at a horizontal sealing surface **19**. This sealing unit **17** will keep the toner
21 in the toner hopper reservoir **5** until the cartridge is ready for use. Once the cartridge
22 is delivered to a customer, the customer removes this sealing unit and toner will be
23 allowed to flow up into the developer roller housing **6**. In addition, the horizontal

1 foam units **18** will also be placed on the horizontal mounting surface **19**. When the
2 developer roller housing **6** is place on top of these horizontal foam units **18**, they will
3 become compressed and will want to expand. Thus these horizontal foam units **18**
4 which provide the force that is exerted on the forward securing edge **7** and applied to
5 the securing fixture **1**, keep the developer roller housing in alignment and stationary.

6 When the developer roller housing **6** is mated to the toner hopper reservoir **5**,
7 a combined rear flange will be created on the rear portion of the two pieces. This
8 combined rear securing flange **12** will protrude outward slightly. This protrusion will
9 allow clips **20** to be used to secure the rear portion of the toner hopper assembly **4**.
10 One lateral edge of the clip **20** will be touching the upper rear flange **8** of the
11 developer roller housing **6** and the other lateral edge will be in contact with the lower
12 rear flange of the toner hopper reservoir **5**. The clamping action of the clip will keep
13 the rear portion secure and in proper alignment. The number of clips used as well as
14 the size and clamping efficiency of the clips may vary depending on the size and
15 shape of the rear combined flange. The main concern for the clips will be the ability
16 to hold the two rear areas together but still be removable for later recycling
17 procedures. Instead of these clips, an alternative manner of attaching these two
18 flanges together may be used such as glue or ultrasonic welding. Gluing the two
19 pieces together would limit the ease of later recycling and ultrasonic welding may
20 prove to be cost ineffective.

21 Another step required before final assembly will be the preparing of the toner
22 hopper reservoir **5** for the fastening of the contact side endplate **16**, as shown in
23 Figure 4. When the contact side endplate **16** is initially separated from the toner

1 hopper assembly **4**, the rivet like structure will need to be cleaned out of the toner
2 hopper reservoir **5** so that a securing anchor **24** (Figure 7) may be affixed in this
3 location. In order to do this more efficiently, a cleaning template **21** has been created
4 to help uniformly guide a cleaning instrument. The cleaning template **21**, shown in
5 Figure 6A and 6B will have three holes **22** which line up to the three positions that
6 need to be cleaned. In the preferred embodiment, a set depth drill bit **23** will be
7 utilized to remove this excess material, as shown in Figure 7. The cleaning template
8 **21** will be placed on top of the toner hopper reservoir **5** and held in place while a drill
9 employing the set depth drill bit **23** will be inserted into the three holes **22**. Once this
10 material has been removed, an anchoring fixture **24** will be inserted and affixed to the
11 orifice **25** and held in place using a permanent type of glue. The contact side endplate
12 **16** will then be able to be secured to the toner hopper reservoir **5** by using a screw,
13 which will pass through the contact side endplate **16** and secure itself into the
14 anchoring fixture **24**. The advantage of using this cleaning template **21** along with
15 the set depth drill bit **23** is that the removal of excess material will always be uniform
16 as well as the risk of compromising the toner hopper reservoir **5** will be diminished.

17 Where the anchoring fixture will attach will depend on the type of anchoring
18 fixture being used as well as the type of toner cartridge the anchor fixture is being
19 installed in. A mating means for attaching the anchor to this orifice or any other
20 mounting area will be described in further detail of this specification. In addition, for
21 the HP 4200 or HP 4300 cartridge types, the endplate that will be secured is located
22 on the contact side of the toner cartridge assembly. In other cartridges the endplate

1 may be located on the drive side or not have contacts at all. The present invention is
2 intended for use in all replaceable consumable units that have an endplate.

3 For the HP 4200 or HP 4300 toner cartridge, the orifices **25** will have an
4 internal wall and an external wall as well as a floor. In the HP 4200 or HP 4300 the
5 orifice is preferably cleaned using the template described above. In an alternative
6 embodiment, these orifices may not need cleaning or boring. As will be described in
7 detail, certain anchoring fixtures will attach to the internal wall of the orifice **25**.
8 Others will attach to the external wall and others will attach to the floor.

9 The anchoring fixture **24** may be made out of various types of materials; for
10 example, plastic or metal may be used. If an anchoring fixture **24** were to be installed
11 in the orifice **25**, it could be held in place by glue or other types of adhesive. Glue
12 would be applied to the bottom of the orifices **25** and the anchoring fixture would
13 then be placed on top of the glue. Alternatively, the anchoring fixture could be sealed
14 so that the friction between it and the orifice **25** would hold the two together. The
15 anchoring fixture may also be attached upon insertion to the orifice **25** on the toner
16 hopper reservoir **5** by ribs as more fully described below. Figure 8A, 8B, 8C, 8D, 8E
17 and 8F are all illustrations of alternative embodiments of the anchoring fixture **24**.

18 Figure 8A is the most simplistic example of an anchoring fixture. In Figure
19 8A, the anchoring fixture **24** would have a top surface **50**, a supporting wall **51** and a
20 securing fixture orifice **52**. In this example, the supporting wall would be one
21 continuous wall since the anchoring fixture **24** is cylindrical in shape. In the
22 preferred embodiment, this type of anchoring fixture **24** would be plastic and would
23 be attached inside the orifice **25** with glue or other types of adhesive. If the diameter

1 of the anchoring fixture were smaller than the diameter of the inside of the orifice,
2 glue might also be applied to the internal wall as well as the bottom. However, if the
3 diameters are significantly different, an alignment issue may arise due to the
4 positioning of the securing fixture orifice **52** within the orifice **25**. Once the
5 anchoring fixture is installed, the endplate will be reattached using some type of
6 securing device. In the preferred embodiment, the securing device will be a screw
7 which attaches to the anchoring fixture **24** at the securing fixture orifice **52**. Instead
8 of a screw however, a rivet or other mechanism may be employed to keep the
9 endplate secured to the anchoring fixture **24** at the securing fixture orifice **52**. In an
10 alternative embodiment the top surface **50** would not have a securing fixture orifice
11 **52**. If the top surface **50** were made of a sufficiently soft plastic or metal than a self-
12 tapping screw could be used to pierce the top surface **50** securing the contact side
13 endplate **16** to the toner cartridge assembly.

14 An alternative embodiment of the anchoring fixture **24** is shown in Figure 8B.
15 In this embodiment the anchoring fixture **24** has contact ribs **53** on the supporting
16 wall **51**. In this embodiment, the contact ribs compress upon installation thus
17 mating with the orifice **25**.

18 Figure 8C is an illustration of a non-cylindrical shaped anchoring fixture.
19 This anchoring fixture has two supporting walls **51** below the top surface **50** as well
20 as the anchor fixture orifice **52**. Additionally, this anchor fixture has contact ribs **53**
21 that protrude out from the center of the anchoring fixture, which will make contact
22 with the internal wall of the orifice **25** of the toner hopper reservoir **5**. These contact
23 ribs **53** will engage the internal wall of the orifice **25** when the anchoring fixture **24** is

1 inserted inside the orifice **25**. Figure 8D is an example of an alternative embodiment
2 of the present invention except that this anchoring fixture **24** has multiple contact ribs
3 **53** on each supporting wall **51**. In the embodiment depicted in Figures 8C and 8D the
4 contact ribs **53** are barbed to ensure a secure mating of the anchoring fixture **24** and
5 the orifice **25**.

6 Figure 8E shows another preferred embodiment of the present invention. The
7 anchoring fixture shown in Figure 8E has external wall contact ribs **54**, which
8 protrude towards the center of the anchoring fixture **24** from the supporting wall **51**.
9 This anchoring fixture would slip around the outside of the orifices **25** and attach
10 itself to the external wall of the orifice **25**. The diameter of this anchoring fixture
11 would be greater than the diameter of the orifice. An advantage to this particular
12 embodiment is that the orifices **25** may not need to be bored out in order for the
13 anchoring fixture **24** to function.

14 Another preferred embodiment is illustrated in Figure 8F. Here internal screw
15 contact ribs **60** would work in conjunction to the contact ribs **53**. When the screw is
16 inserted into the securing fixture orifice **52**, and starts to engage the screw contact ribs
17 **60**, the contact ribs **53** will begin to move outward from the center of the anchoring
18 fixture **24** engaging with the orifice **25** securing the anchoring fixture **24**. Once the
19 screw is fully inserted into the anchoring fixture **24**, the contact ribs **53** are embedded
20 into the side of the orifice internal wall, and will securely hold the anchoring fixture
21 **24** in place.

22 In all the previous examples, the anchoring fixture **24** has been attached to an
23 orifice already existing on the toner cartridge. The anchoring fixture **24** need not be

1 attached to an orifice. Instead it may simply attach to a surface of the toner cartridge.
2 The main requirement would be that there be enough surface area for the anchoring
3 fixture 24 to mount.

4 Although this invention has been described with respect to the specific
5 embodiments herein, it should be understood that the invention is not limited to these
6 embodiments, they may take other shapes and forms to accommodate the particular
7 toner cartridges at issue. Other variations and departures from the specific
8 embodiment disclosed herein may also be used without departing from the spirit of
9 this invention.

10